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A REVIEW OF THE PEDICULATE FISHES OR ANGLERS OF JAPAN.

BY

DAVID STARR JORDAN,

ASSISTED BY

MICHITARO SINDO,

Of the Leland Stanford Junior University.

From the Proceedings of the United States National Museum, Vol. XXIV, pages 361-381.

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A REVIEW OF THE PEDICULATE FISHES OR ANGLERS OF JAPAN.

By David Starr Jordan (assisted by Michitaro Sindo),
Of the Leland Stanford Junior University.

In the present paper is given an account of the species of Pediculati, or Angler-fishes, known to inhabit the waters of Japan. With other papers of this series it is based on the collections made by Messrs. Jordan and Snyder in 1900, under the auspices of the Hopkins Seaside Laboratory of Leland Stanford Junior University, a duplicate series being deposited in the United States National Museum, and upon specimens collected by the United States Fish Commission steamer *Albatross*.

Order PEDICULATI.

THE PEDICULATE FISHES.

Carpal bones notably elongate, forming a kind of arm (pseudobrachium) which supports the broad pectoral. Gill opening reduced to a large or small foramen situated in or near the axil, more or less posterior to the pectorals. Ventral fins jugular if present; anterior dorsal reduced to a few tentacle-like, isolated spines; soft dorsal and anal short; no scales. First vertebra united to cranium by a suture; epiotics united behind supraoccipital; elongate basal pectoral radii (actinosts, reduced in number; no interclavicles; post temporal broad, flat, simple; upper pharyngeals 2, similar, spatulate, with anterior stem and transverse blade; basis of cranium simple; no air duct to the swim bladder. Marine fishes, chiefly of the tropics and the oceanic abysses. The group is an offshoot from the Acanthopteri, its chief modification being in the elongation of the actinosts and in the position of the gill opening. The Batrachoididæ are perhaps its nearest relatives.

(*Pediculatus*, having a foot-stalk.)

Analysis of families of Japanese Pediculati.

a. Gill openings in or behind the lower axil of the pectoral; mouth large, terminal.
b. Pseudobranchiæ present; base of pectoral with two actinosts; head broad, depressed, the enormous mouth with very strong teeth; ventrals large. LOPHIIDÆ, I.
bb. Pseudobranchiæ none; base of pectoral with 3 actinosts.
c. Ventrals present; the arm angulate, pseudobrachia elongate. ANTENNARIIDÆ, II.
aa. Gill openings in or behind upper axil of pectoral; mouth small, inferior; skin with warts or prickles..... OGCOCEPHALIDÆ, III.

Family I. LOPHIIDÆ.

THE ANGLERS.

Head wide, depressed, very large. Body contracted, conical, tapering rapidly backward from the shoulders. Mouth exceedingly large, terminal, opening into an enormous stomach; upper jaw contractile; maxillary without supplementary bone; lower jaw projecting; both jaws with very strong, unequal, cardiform teeth, some of teeth canine-like, most of them depressible; vomer and palatines usually with strong teeth. Gill openings comparatively large, in lower axil of the pectorals. Pseudobranchiæ present. Gill rakers none; gills 3. Skin mostly smooth, naked, with many dermal flaps about the head. Spinous dorsal of 3 isolated, tentacle-like spines on head and 3 smaller ones behind, which form a continuous fin; second dorsal moderate, similar to the anal; pectoral members scarcely geniculated, each with two actinosts and with elongated pseudobrachia; ventrals jugular, I, 5, widely separated, large, much enlarged in the young. Young with the head spinous. Pyloric cæca present.

Fishes of the sea bottom, living at moderate depths, remarkable for their great voracity.

a. Vertebræ reduced in number, 18 to 20 in all ..... *Lophiomus*, I.

1. LOPHIOMUS Gill.

Lophiomus GILL, Proc. U. S. Nat. Mus., V, 1882, p. 552 (*setigerus*).

This genus includes those species of Lophiidæ which have the vertebræ reduced in number, 18 or 19, instead of about 30, as in *Lophius*, a fact associated with their tropical distribution. The species inhabit the Pacific, those of *Lophius* being found in the Atlantic.

(*Lophius:* ὠμός, shoulder, in allusion to the trifid humeral spine.)

a. First dorsal spine higher than second; ventral fins pale; inside of mouth anteriorly black, with pale spots; peritoneum blackish; head less than half length. *setigerus*, 1.
aa. First dorsal spine not higher than second; ventral fins black on the inner side; inside of mouth unmarked; peritoneum pale; head not less than half length. *litulon*, 2.

1. LOPHIOMUS SETIGERUS (Vahl).

ANKO.

Lophius setigerus VAHL, Skrivt. Naturh., IV, 1797, p. 214, pl. III, figs. 5, 6; China Sea.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., XII, 1837, p. 383, after Vahl and a Japanese drawing.—GÜNTHER, Cat. Fish., III, 1861, p. 180; Japan (not *Lophiomus setigerus* Gilbert and of Jordan and Evermann, an American species, *Lophiomus caulinaris* Garman, from the Galapagos).

Lophius viviparus SCHNEIDER, Syst. Ichth., 1801, p. 142, pl. XXXII, after Vahl.

Head, measured to the anterior edge of gill opening, $2\frac{2}{3}$ in length of body without caudal; width, 2 in head; width of mouth, $3\frac{1}{5}$; snout, $9\frac{1}{4}$ in total length, or $1\frac{1}{5}$ in interorbital space; eye, $2\frac{1}{2}$ in snout; D. IV + II, 9; A. 7; P. 22; V. 7; caudal fin, $4\frac{4}{5}$; pectoral fin, 6; first dorsal spine, $4\frac{2}{3}$ in length, with a simple slender flap on end, placed on the edge of receding lip; second spine $1\frac{1}{2}$ to $1\frac{2}{3}$ in the first, standing very closely behind the latter; enveloped in filamentous skinny fold; third spine inserted under tip of the depressed second spine, slender and bony as the first spine, but tapering to a fine point without a filament; its proximal end concealed; fourth spine beginning on cross line from the tip of humeral spine to the other, and of exactly the same structure as the third, but in some cases a little shorter; two very short spines similar to the second spine placed close together half way between the fourth spine, and dorsal fin; rays of soft dorsal nearly equal in height, except the first and last, which are somewhat shorter than the rest, their free tips projecting; numerous spines on head, those at the tip of snout and on the ridge above eye, at the angle of mouth, and the region of occiput being most prominent, especially in young specimen; humeral spine trifid, with a minor branch near its root, the posterior branch longest and usually bifid, pointing backward; the spine thus ends in five points; long filaments along jaw, angle of mouth, and side of body; small ones all over dorsal side of body and fins; one specimen from Nagasaki has also two tentacles on snout developed into two knob-like processes. Ventral side free from filaments; teeth on mandible in alternate rows, those in the inner row being longest and pointing inward; all except a few on outermost row near the angle depressible; teeth in maxillary also very irregular in height and arrangement; those on outermost row short and pointing outward and generally depressible, those near the angle inward; those on inner rows inclining inward and nearly all depressible.

Color of body gray to grayish brown, with numerous lighter dots with black border. The specimens from Nagasaki are more grayish than brownish, with numerous minute black dots on back of head, body, and spines; small filaments generally black; four black filaments equally distributed in a row on caudal fin near the end; dorsal fin marbled with blackish markings; pectoral fins darker than head; ventral side white; ventral fins pale, unmarked, sometimes a dusky shade

on lower side of pectoral and around vent; peritoneum black; inside of mouth anteriorly black, with round yellowish spots.

Coasts of southern Japan, rather common; our specimens from Wakanoura and Nagasaki. This species is evidently identical with Vahl's original figure as copied by Schneider.

(*Setiger*, bristle-bearing.)

Measurements of Lophiomus setigerus.

Locality.	Nagasaki.	Nagasaki.
Length in millimeters without caudal	238	175
Dorsal rays	IV–II, 9	IV–II, 9
Caudal ray	8	8
Anal rays	7	7
Pectoral rays	23	22
Ventral rays	5	5
Head in hundredth of length without caudal	55	57
Width of head	60	66
Width of body close to gill opening	22	27
Depth of caudal peduncle	5	5
Length of tail	35	35
Snout	14	17
Length of maxillary	20	22½
Intermaxillary space	8	8
Diameter of eye	7	7
Interorbital space	11½	12
Snout to tip of humeral spine	45	47
Distance between tips of humeral spine	40	41
Snout to first dorsal spine	4	5
Height of first dorsal spine	27	26
Snout to second dorsal spine	6	7
Height of second dorsal spine	15	16
Snout to third dorsal spine	24	26
Height of third dorsal spine	21½	23
Snout to fourth dorsal spine	38	37
Height of fourth dorsal spine	21	20
Snout to dorsal fin	60	58
Length of base of dorsal fin	30	25
Height of dorsal ray	20	20
Length of caudal ray	25	25
Height of anal fin	17	18
Length of pectoral fin	20	23
Length of ventral fin	14	14
Ventral fin to vent	43	41
Vent to anal fin	6	5½

2. LOPHIOMUS LITULON Jordan, new species.

Lophius setigerus ISHIKAWA, Prel. Cat., 1897, p. 36; Boshu (not of Vahl).

Lophiomus setigerus JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1900, p. 380; Tokyo.

Head of the type specimen, measured to gill opening, 2 in length to base of caudal; its width equal to its length; snout, $6\frac{2}{3}$ in head; eye, $2\frac{1}{2}$ in snout; length of maxillary, 5 in head; space between maxillaries, $2\frac{1}{2}$ in maxillary; interorbital space, 8 in length of body; snout to tip of humeral spine, $2\frac{1}{2}$; distance between tips of opposing humeral spines, $2\frac{6}{7}$; D. IV–11 9; A. 8; C. 8; P. 23; V. 5; width of body close to gill opening, $5\frac{1}{4}$, being a little more than its depth; length of tail, 3; depth of caudal peduncle, 2 in snout; base of dorsal fin, 3; its height, $5\frac{5}{9}$; base of anal fin, $4\frac{1}{2}$, height, $4\frac{2}{9}$; caudal fin, 4; pectoral fin, $4\frac{1}{2}$; ventral fin, $6\frac{1}{4}$.

First dorsal spine lower than the second, its height being equal to snout, with rather stout, simple tentacle. Second dorsal spine thinly

concealed in a scantily filamentous membrane, with a small tentacle on tip, its height 5 in length. Third spine 5¼, standing one-fourth of length behind snout, proximally embedded, slender, and tapered into a hairy point. Fourth, fifth, and sixth spines of same structure as the third, frail, following closely together behind the third; the height of the fourth the same as that of the first, the remaining two somewhat shorter. Soft dorsal fin beginning a little in advance of vent, its membrane extending to end; tips of rays curled back; anterior rays shorter, especially the first; fifth ray highest, its tip, held down, reaches to the posterior base of the fin, where the tips of the remaining rays also terminate. Anal fin begins a little behind vent, its membrane extending to the end as in the dorsal; fifth or longest ray

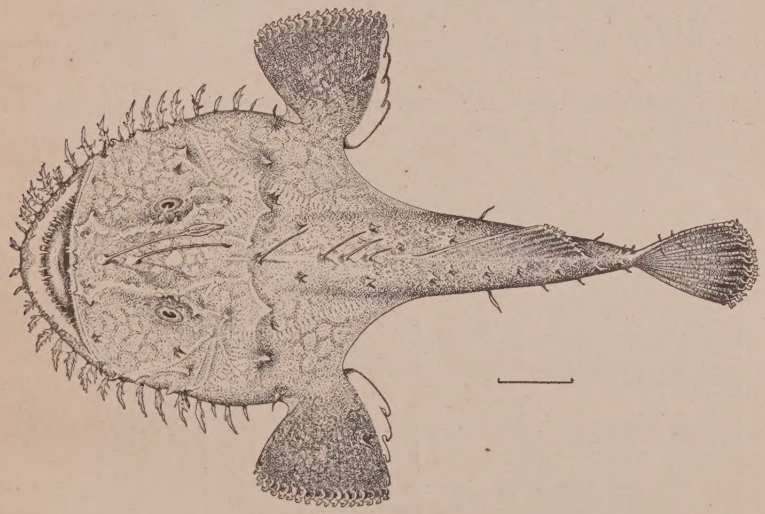

FIG. 1.—LOPHIOMUS LITULON.

extending beyond the posterior base of the fin. Filaments around mouth and on body not so numerous as in *L. setigerus*, those on body not forming a row. Spine on head rather high. Humeral spines simple, stout, pointing more upward than backward. Peritoneum uncolored, pale; teeth arranged as in *L. setigerus*. Mouth unmarked, pale within, and without spots.

Color of the type specimen pale brownish orange, with brown streaks and numerous small, light dots reticulating all over dorsal surface; roots of posterior dorsal spines and ends of fins blackish brown, as are also the filaments on body. Belly whitish, without markings except the inner side of ventral fin, which is dark brown; lower side of body brown, unmarked; inside of mouth without markings.

Coasts of middle Japan, as common as the preceding, but ranging

farther north. Our specimens are from Tokyo, Wakanoura, Totomi Bay and Matsushima Bay, the last two dredged by the U. S. Fish Commission steamer *Albatross*.

This description is from a specimen obtained in Tokyo. All other specimens have a blackish gray color, especially that from Matsushima, with the ends of fins and filaments black or blackish.

The chief differences between *L. litulon* and *L. setigerus* are the following: In *L. litulon* the first dorsal spine is not longer than the second, the ventral fin is colored, the inside of the mouth is unmarked, the membranes in the dorsal and anal fins extend to the tips of the rays, the peritoneum is uncolored, the head is generally less than 2 in length, but never more, as is invariably the case in *L. setigerus*, and the pectoral fins are slenderer.

This species, with the preceding, is known as *Anko;* in some localities the male is called *Kianko*, or true *Anko*, the female *Mizuko* (water creature).

(λίτος, plain-colored; οὖλον, gums; the species lacking the peculiar mouth markings of *L. setigerus*.)

Measurements of Lophiomus litulon.

Locality.	Tokyo.	Matsushima.	Wakanoura.	
Length in millimeters	192	266	97	86
Number of dorsal rays	II–IV–9	II–IV–10	II–IV–9	II–IV–9
Number of caudal rays	8	8	8	8
Number of anal rays	8	8	8	8
Number of pectoral rays	23	23	23	25
Number of ventral rays	5	5	5	5
Head in hundredths of length	51	49	45	51
Width of head	51	51	54	52
Width of body close to gill opening	19	17	18	19
Depth of caudal peduncle	5	5	5	5
Length of tail	35	38	34	33
Snout	15	15	15	14½
Length of maxillary	20	20	21	21½
Space between maxillaries	8	8½	7½	8
Diameter of eye (transversely)	6½	7	8	8
Interorbital space	13	13	13½	13
Snout to the tip of humeral spine	39	40	39½	42½
Distance between tips of humeral spine	35	33	32	36
Snout to first dorsal spine	5½	5	5	5½
Height of first dorsal spine	15	19	12	14
Snout to second dorsal spine	9	8½	8½	8½
Height of second dorsal spine	20	22½	19	22
Snout to third dorsal spine	26	24	25	28
Height of third dorsal spine	19	14	14	17
Snout to fourth dorsal spine	37½	35	38	38
Height of fourth dorsal spine	15	14	13	16
Snout to root of dorsal fin	62	60	60	63
Length of base of dorsal fin	32	.....	31	29½
Height of dorsal ray	18	.....	23	23
Length of caudal fin	25	28	27	30
Base of anal fin	27	.....	.....	.....
Height of anal fin	21½	.....	18	30
Length of pectoral fin	21½	29	28	34
Length of ventral fin	16	15	20	24
Ventral fin to vent	43	33	42	41
Vent to anal fin	4	7	3	4

Family II. ANTENNARIIDÆ.

FROG-FISHES.

Head and body more or less compressed. Mouth vertical or very oblique, opening upward; lower jaw projecting; jaws with cardiform teeth; premaxillaries protractile. Gill openings small, pore-like, in or behind the lower axils of the pectorals. No pseudobranchiæ. Gills 2½ or 3; skin naked, smooth, or prickly. Pectoral members forming an elbow-like angle. Pseudobrachia long, with 3 actinosts. Ventral fins present, jugular, near together. Spinous dorsal of 1 to 3 serrated, tentacle-like spines; soft dorsal long, larger than anal. Pyloric cæca none. Inhabitants of tropical seas, often living on floating seaweed, and enabled, by filling the capacious stomach with air, to sustain themselves on the surface of the water, therefore widely dispersed by currents in the sea.

a. Head compressed; a rostral spine or tentacle, followed by two larger spines; palatine teeth developed; dorsal spines disconnected.
b. Skin naked and smooth; ventral fins elongate ..... *Pterophryne* 2
bb. Skin covered with prickles; ventral fins short ..... *Antennarius*, 3
aa. Head cuboid; a single rostral spine or tentacle, received in a groove; soft dorsal low ..... *Chaunax*, 4

2. PTEROPHRYNE Gill.

Pterophryne Gill, Proc. Ac. Nat. Sci. Phila., 1863, p. 90 (*histrio*).
Pterophrynoides Gill, Proc. U. S. Nat. Mus., I, 1878, p. 216 (*histrio*). Name a substitute for *Pterophryne*, if regarded as preoccupied by an earlier name *Pterophrynus*.

Body short, somewhat compressed, with tumid abdomen, and covered by smooth or slightly granular skin; mouth small, oblique; palate with teeth; wrist slender; ventrals elongate; color light brown, much varied, with silvery dark markings. Small fishes of fantastic forms, widely distributed, living in floating seaweed. The species are very much alike and subject to much variation, and therefore not well defined or understood.

(πτερόν, wing; φρύνη, toad.)

a. Body with very few round, small white spots or none; belly with faint blackish spots; sides with numerous filaments ..... *histrio*, 3
aa. Body with very many round white spots of different sizes; belly without dark spots; sides with few filaments; dark markings sharper and broader than in *P. histrio* ..... *ranina*, 4

3. PTEROPHRYNE HISTRIO (Linnæus).

Lophius histrio LINNÆUS, Syst. Nat., 10th ed., 1758, p. 327; China, after *Lophius pinnis dorsalibus tribus* of Lagerstrom; may be any *Histrio* of Asiatic waters.

?Lophius histrio var. *marmoratus* SCHNEIDER, Syst. Ichth., 1801, p. 142; after a figure of Klein, locality unknown, called *Batrachus mollis* Klein, Missus III, 1742, p. 16, pl. XIV, fig. 4, white spots very few; may be any *Pterophryne*.

Chironectes marmoratus SCHLEGEL, Fauna Japonica, 1846, p. 159, pl. LXXXI, fig. 1; Nagasaki.

Antennarius marmoratus of most recent authors.

Head measured to gill opening 2 in length, depth $1\frac{6}{7}$; width 5; length of tail 3; caudal peduncle $6\frac{2}{3}$; length of maxillary 5; snout $2\frac{1}{4}$ in maxillary; eye 2 in snout; snout to end of actinosts $1\frac{2}{3}$ in length;

FIG. 2.—PTEROPHRYNE HISTRIO.

height of dorsal, anal, and caudal rays each 3 in length of body; base of dorsal fin $1\frac{6}{7}$. Pectoral and ventral fin each 4 in length. D. III–12; A. 7; C. 8; P. 10; V. 5. Height and position of dorsal spines essentially as in *P. raninus*, except that the tentacle on first spine is smaller; mouth oblique; skin not very loose; filaments numerous, rather stout, high, those on jaw and belly specially so; dorsal, pectoral and ventral fins with very small filaments anal, and caudal fins free from them.

Color pale yellowish, with grayish tinge, marbled with blackish streaks punctuated by a few dots of the ground color; belly with faint blackish dots, filaments on belly immaculate; streaks on fins forming irregular bands; four cross bands on caudal very distinct, with sharp edges; marking around head on same general plan as that of *P. raninus*.

but with the light streaks wider; sides of body with few filaments and no well-defined round white spots.

The chief points of difference between this species and the next are the following: *Pterophryne histrio* has very few pale spots or dots on body; the filaments are more numerous and stouter, the four dark bands on the caudal more sharply defined, the belly with a few dark spots.

Coasts of Japan, in the open sea or current of the Kuro Shiwo, not rare. Our two specimens are from Kisaki and Enoshima.

The synonymy of this species is extremely doubtful. Probably most of the descriptions published under the names of *marmoratus* and *histrio* belong to it. The American species, called *Pterophryne histrio* by Jordan and Evermann, if distinct, should probably stand as *Pterophryne tumida* (Osbeck). This species was based on specimens from the Sargasso Sea, while the original type of *Lophius histrio* was Chinese.

(*Histrio*, a harlequin).

Measurements of Pterophryne histrio.

Locality.	Misaki.
Length in millimeters	77
Fin rays	D. III, 12; A. 7; C. 8; P. 10; V. 5.
Head in hundredths of length	50
Width of head	20
Depth of head	56
Length of tail	33
Depth of caudal peduncle	15
Width of body above vent	12
Snout	9
Eye	4
Width of interorbital region	10
Length of maxillary	20
Snout to first dorsal spine	5
Height of first dorsal spine	5
Height of second dorsal spine	13
Snout to third dorsal spine	17
Height of third dorsal spine	18
Snout to root of dorsal fin	44
Height of dorsal rays	32
Length of dorsal fin	56
Length of caudal fin	32
Height of anal fin	32
Snout to end of actinost	60
Length of pectoral fin	24
Length of ventral rays	25
Snout to root of ventral rays	40

4. PTEROPHRYNE RANINA (Tilesius).

Lophius raninus Tilesius, Mém. Natur. Mosc., XI, pl. xvi, 1809; Japan.
Antennarius nitidus Bennett, Zool. Journ., III, p. 375, pl. ix, fig. 2.
Antennarius marmoratus var. *raninus*, Günther, Cat. Fish., III, 1861, p. 187; China, Pinang.—Ishikawa, Prel. Cat., 1897, p. 36; Tokio, Sagami.

Head measured to gill opening in axil, $1\frac{2}{3}$ in length, its depth slightly exceeding its length, width 6 in its depth; length of tail, $2\frac{6}{7}$; snout, $5\frac{1}{2}$ in depth of head; eye, $2\frac{1}{2}$ in snout; length of maxillary, 4. D. III, 12; A. 7; P. 9; V. 5. Snout to end of wrist, $1\frac{1}{4}$; height of dorsal rays,

$2\frac{7}{9}$; its base, 4; length of caudal fin, $2\frac{7}{9}$; that of pectoral fin, $3\frac{2}{3}$; ventral rays, $3\frac{2}{3}$.

First dorsal spine placed an eye's length behind tip of snout, slender, one-half in height of the second or equal to diameter of eye, with short, uncolored bifid tentacle; second dorsal spine situated just posterior to the first, straight filamentous, curved, imbedded posteriorly in a fold of skin extending from the back. Posterior rays of dorsal and anal fins extending one-fourth way into caudal fin. Wrist a little shorter than pectoral fin, with gill opening at its middle. Tip of pectoral fin reaches back to the middle of caudal peduncle. Ventral fins

FIG. 3.—PTEROPHRYNE RANINA.

slender, the tip reaching anteriorly to the vertical line from front of eye. Mouth oblique. Body finely granular, the skin very loose.

Color of body pale, yellowish gray, marbled with blackish brown; belly uncolored; many small sharply-defined white spots all over body except on caudal fin. Filaments on head and belly rather few, those on belly rising from center of white spots. A narrow, white-margined gray streak radiating posteriorily from eye and dilating behind; a wide, irregular, unmargined streak upward, meeting with the opposite one at posterior base of second dorsal spine; another wide streak of similar nature ventrally dilating and ending at the angle of mouth. Two large, pale, white-margined gray spots on side of body, each with a white filament in its center; ventral fins irregularly barred;

the antero-ventral side of pectoral fins light, except a brown bar running obliquely across each; postero-dorsal side thickly marbled, tips of rays pale yellow; caudal fin somewhat more regularly barred than others.

Coasts of Japan; less common than the preceding; here described from a specimen 4¼ inches long from Wakanoura.

This species is apparently distinct from the preceding, and both are probably different from the American species, *Pterophryne tumida* and *P. gibba*. A fourth species, very close to the *Pterophryne ranina* similarly spotted with white, but differing in other markings, is found in the Philippines. This form may be the original *marmoratus* of Klein and Schneider, or it may be that all these various patterns of coloration may be mere varieties of *P. histrio* and that but a single species of *Pterophryne* exists.

The synonymy of this species, like that of the preceding, is very doubtful, the names adopted for both being tentative only.

(*Ranina*, like a frog.)

Measurements of Pterophryne ranina.

Locality.	Wakanoura.
Length in millimeters	84
Fin rays	D. III, 13; A. 6; C. 8; P. 9; V. 5
Head measured to gill opening in hundredths of length	56
Width of head	29
Depth of head	60
Length of tail	35
Depth of caudal peduncle	17
Width of body above vent	11
Snout	11
Eye	5
Width of head at orbital region	12
Length of maxillary	25
Snout to first dorsal spine	6
Height of first dorsal spine	5
Height of second dorsal spine	12
Snout to third dorsal spine	21
Height of third dorsal spine	20
Snout to root of dorsal fin	45
Height of dorsal rays	37
Length of dorsal fin	58
Length of caudal fin	37
Height of anal fin	35
Snout to end of actinosts	63
Length of pectoral fin	27
Length of ventral rays	29
Snout to root of ventral rays	42

3. ANTENNARIUS Lacépède.

Antennarius COMMERSON in LACÉPÈDE, Hist. Nat. Poiss., I, 1798, p. 323. Footnote only; not accepted by Lacépède.

? *Histrio* FISCHER, Zoognosia, 3d ed., I, 1813, p. 78. Definition incorrect; through a slip of the pen, "caput depressum" written instead of "caput compressum." No type mentioned. Fischer's *Lophius histrio* (Bloch, IV, p. 10, pl. CXI) is partly a true *Antennarius* according to Dr. Gill, probably *A. scaber*.

Lesches (*Antennarius* Commerson) CUVIER, Règne Animal, 1st ed., I, 1817, p. 310; 2d ed., II, 1829, p. 251. *Chironectes* preoccupied in mammals by *Chironectes* Illiger, 1811.

Body oblong, compressed, very deep through the occipital region, tapering behind; breast tumid; mouth rather large, more or less oblique, or even vertical; cardiform teeth on jaws, vomer, and palatines; eye small; skin with small granules or spinules, these usually forked, and often with numerous fleshy slips. First dorsal spine developed as a small rostral tentacle; second and third dorsal spines strong, covered with skin, often with numerous fleshy filaments; soft dorsal high and long; anal short and deep; caudal fin rounded, the peduncle free; pectoral fins wide, with a rather wide wrist, at the lower posterior angle of which are the very small gill openings; ventral fins short. Fantastic looking fishes, often gayly colored; very numerous in warm seas.

(*Antenna*, a feeler or tentacle.)

a. Color brown, with blackish streaks and markings, and without red spots; first dorsal spine trifid.

b. Dorsal fin without large black ocellus at its base just behind its middle; stripes on body rather broad and more or less irregular, without the definite arrangement seen in the next species ..... *tridens*, 5.

bb. Dorsal fin with a single large black ocellus at its base just behind the middle; lines on body narrow, forming a regular complicated pattern ..... *scriptissimus*, 6.

aa. Color pinkish with a few blood-red spots, besides red streaks and markings; first dorsal spine trifid ..... *sanguifluus*, 7.

aaa. Color black, with small white specks, and larger jet-black blotches; first dorsal spine simple ..... *nox*, 8.

5. ANTENNARIUS TRIDENS (Schlegel).

IZARI-UWO (CRAWLING FISH).

Chironectes tridens SCHLEGEL, Fauna Japon., 1846, p. 159, pl. LXXXI, figs. 2, 3, 5; Nagasaki.—BLEEKER, Verh, Bat. Gen. Japan, XXV, p. 47; Nagasaki.

Antennarius tridens GÜNTHER, Cat. Fish., III, 1861, p. 191; China.—NYSTROM, Kong. Svensk. Vet. Ak., 1887, p. 37; Nagasaki.—ISHIKAWA, Prel. Cat., 1897, p. 36; Tokyo, Kagoshima, Ogosahara, Bonin Islands.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 380; Yokohama.

Head $1\frac{3}{4}$ to 2 in body, $2\frac{1}{4}$ in total length. Depth $2\frac{1}{2}$ ($2\frac{1}{3}$ to $2\frac{3}{4}$) in body. Snout $5\frac{1}{2}$ in head, $2\frac{1}{2}$ in cleft of mouth, which is almost vertical. Eye $1\frac{1}{2}$ in snout.

D. III, 12; A. 7; P. 11; V. 5; C. 9. First dorsal spine 4 in head, with trifid tentacle of variable length, the two outer flaps are longer and stouter than the middle one, usually as long as the spine or even longer. Second spine shorter than the first by one-third to one-fourth of its height, slightly curved, its filamentous tip, when laid down, reaching the same point as that of the first. Third spine rising proximal to this point, which is opposite to the posterior edge of the maxillary; height of the spine $2\frac{1}{2}$ to $2\frac{2}{3}$ in depth of body, $3\frac{1}{2}$ in head; a dermal fold extends posteriorly to the base of soft dorsal. Soft dorsal beginning opposite to the anterior margin of the pectoral fin, its height about equal to the anal, its length $1\frac{1}{5}$ in head; its last ray does

not extend to caudal fin; length of anal 4½ in head, the last ray usually extends to or beyond the root of caudal fin; length of caudal fin somewhat greater than the height of the dorsal, being 2¼–2½ of caudal peduncle, 2¼ in head. Pectoral fins short, about 1½ in caudal; 4½ in head; bent backward, the tips do not quite reach to vent. The majority of Nagasaki specimens have longer pectoral fins, their tips reaching to vent. Ventral fins very short, about 2 in the pectoral.

Body covered with bifid spinules. Stubble-like mucous tubes with clusters of spinules around them running in a row along supraorbital edge and extending along edge of cheeks or scattered over head, especially on lower jaw; filaments rather numerous over head and body, conspicuous on jaw and around mouth; some specimens have scarcely any on body.

Ground color pale bluish gray, marked with black elongate spots or detached bars of various forms, those on body usually running diagonally transverse, those on abdominal region almost laterally; fins more or less regularly barred with rows of dots, those of the caudal being more regular; the dorsal fin, or its base, often marked with two or more large, diffuse, semiocellated spots, similar spots sometimes present on side of body also; usually seven black streaks radiating from eye in equal distance to each other; rest of head and body covered with numerous black spots, most conspicuous around ventral fins; first dorsal spine checked with six or more black bars.

Coast of Japan, in shallow, muddy bays, almost everywhere very common, the colors variable, but always dull.

Yellow specimens, similar to the yellow variety figured by Schlegel and referred by him to *A. tridens*, were taken at Nagasaki. These have been mislaid and can not be compared by us with the typical form. The yellow form is probably not a distinct species.

Our many specimens are from Nagasaki, Wakanoura, Kobe, Enoshima, Uraga, Misaki, and Tokyo.

(*Tridens*, three-toothed.)

6. ANTENNARIUS SCRIPTISSIMUS Jordan, new species.

Head to gill opening about ⅓ the length; a little less than depth of body. Lateral line ceasing under soft dorsal composed of 14 large pores; skin everywhere very rough. D. III–12; A. 8; pores of lateral line 14. First dorsal spine slender; its length scarcely more than two times diameter of eye; third dorsal spine very stout, rough.

Color yellowish gray; everywhere covered with narrow straightish, parallel, dark brown lines running in different directions on different parts of the body; some radiate from eye; some extend from eye horizontally to above pectoral; those below eye extending downward and backward to pectoral, ventral, and throat; stripes behind pectoral radiating from axil; those nearest gill opening curving around it; streaks

above level of gill opening nearly vertical, below nearly horizontal; the former at right angles to those running backward from eye; streaks on back above lateral line nearly vertical and extending upward across third dorsal spine and soft dorsal fin; anal, caudal, and pectoral with oblique, wavy, dark cross streaks. A single ocellus present, large, dark brown, with a pale edge, on base of soft dorsal, behind its middle.

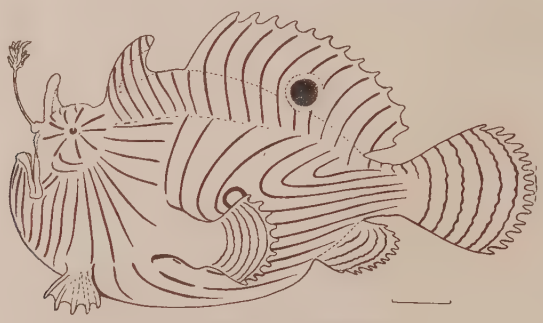

FIG. 4.—ANTENNARIUS SCRIPTISSIMUS.

The type, a stuffed specimen in good condition, 10 inches long, is in the Imperial Museum at Tokyo. It was taken at Boshu, province of Awa, at the entrance of Tokyo Bay.

The accompanying illustration is from a copy of a rough sketch of the type. It was designed only to show the markings. It is not correct as to details of form.

(*Scriptissimus*, much written over.)

7. ANTENNARIUS SANGUIFLUUS Jordan, new species.

Head, measured to gill opening at the base of pectoral fin, 2 in body, $2\frac{2}{5}$ in total length. Depth $1\frac{2}{3}$ in body, $2\frac{1}{5}$ in total length; trunk equal to tail; D. III—12; A. 7; C. 9; P. 10; V. 5. Caudal fin $1\frac{1}{2}$ in tail, $2\frac{1}{5}$ in caudal peduncle. First dorsal spine slender, high as the length of snout, placed above nostrils, with a stout, knob-like tentacle; second spine free, rough, curved backward, half the eye's length higher than the first; third spine embedded, very stout, curved strongly backward, 3 in depth, $1\frac{2}{3}$ of the second. Snout $5\frac{1}{2}$ in head. Eye $1\frac{1}{2}$ in snout. Length of base of dorsal fin equal to depth of body. Pectorals reaching to vent. Spines bifid; integument firm. General features essentially as in *Antennarius nox*, except as to color.

Color in life, as in spirits, pinkish; a blood-red spot with lighter center on each side of body, above gill opening, on the level of angle of mouth; one red spot at anterior base of dorsal fin; a red streak along the antero-dorsal edge of wrist; last rays of dorsal and anal fins and tip of caudal fin also red; minute red spots on dorsal fin; a large

brown spot at middle of the base of dorsal fin; first ray of dorsal fin and upper part of caudal fin brown; brown streaks radiating from eye; numerous minute brown spots in form of rings or streaks on side of body, especially at the root of pectoral fins; spinules uncolored.

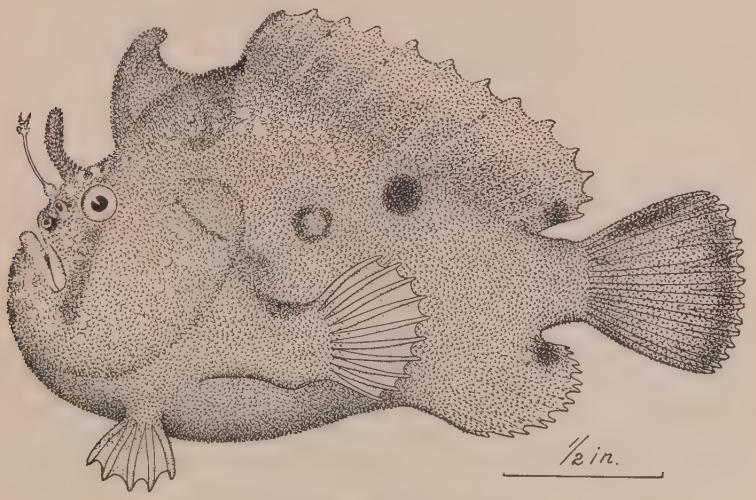

FIG. 5.—ANTENNARIUS SANGUIFLUUS.

Two specimens are known, both from Misaki, the one collected by Dr. Jordan, the other by Dr. Mitsukuri.

(*Sanguis*, blood; *fluus*, flowing.)

8. ANTENNARIUS NOX Jordan, new species.

Head $1\frac{3}{4}$ in body, or $2\frac{3}{5}$ in total length. Depth equal to head; height of the dorsal fin equal to the length of the caudal. D. III–12; A. 7; P. 11; V. 5; C. 9. Caudal peduncle 2 in caudal fin; snout 6 in head, $2\frac{1}{3}$ in cleft of mouth, which is nearly vertical; eye less than 2 in snout. First dorsal spine 2 in caudal fin, or $3\frac{1}{2}$ in head, the stout tentacle usually quadrifid, but sometimes trifid, as in *A. tridens;* second spine stout, slightly lower than the first, perceptibly curved, devoid of filaments, with a thin, free membrane posteriorly; it stands $\frac{2}{3}$ the length of eye behind the base of the first. Third dorsal spine $1\frac{1}{3}$ in caudal fin, $2\frac{1}{4}$ in depth; curved considerably backward; dermal fold extending from the top to the base of first soft dorsal ray, whence the tip of spine also reaches. Dorsal fin a little longer than head; the third ray from last extending to the caudal fin; anal slightly lower than dorsal, length $1\frac{1}{3}$ in caudal peduncle, $2\frac{1}{2}$ in head; the tip extending well beyond base of caudal. Pectoral fin $2\frac{1}{4}$ its width, 3 in head; laid against body

its tip reaches to vent; ventral fin 5 in head, placed directly beneath eye.

Body covered with forked spinules; skin firmer and tighter than that of *A. tridens*. Color black or dusky brown, with two (or three) large and several small jet-black spots on each side of body and dorsal fin; black streaks radiating from eye; a white blotch at the posterior base of second dorsal spine; minute white spots scattered on dorsal fin; each caudal ray with a white spot a little below middle, forming a transverse row on the fin. Some specimens are almost perfectly black, hardly

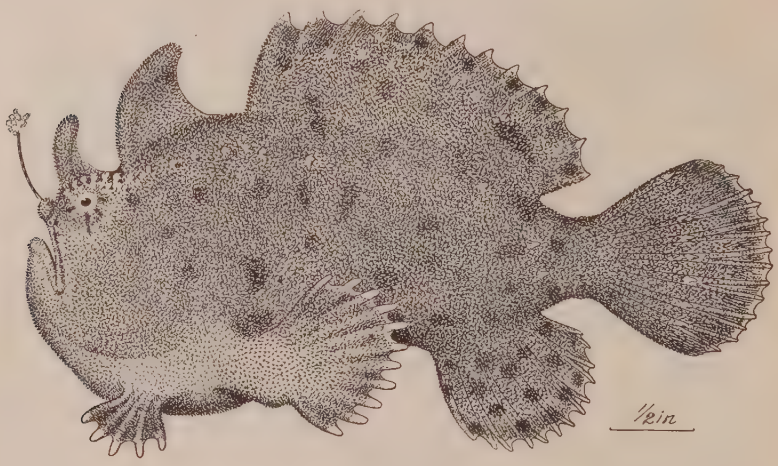

FIG. 6.—ANTENNARIUS NOX.

any marks being distinguishable. Belly and tip of pectoral, ventral, and anal fins dull dark gray; very short filaments from the tops of small white protuberances sparsely scattered over body; arrangement of mucous tubes similar to that of *A. tridens*.

This species differ from *A. tridens* in color, length of fins, especially that of dorsal and anal fins, and in having firmer and tighter integument; second and third dorsal spines and soft dorsal without filaments.

Our specimens, 6 in number, are from Wakanoura and Nagasaki.

(*Nox*, night).

4. CHAUNAX Lowe.

Chaunax LOWE, Trans. Zool. Soc. Lond., III, 1846, p. 339 (*pictus*).

Head very large, depressed, cuboid. Mouth large, subvertical; jaws and palate with bands of small teeth. Skin with small, sharp spines. Spinous dorsal reduced to a small tentacle above the snout, retractile into a groove; soft dorsal moderate, low; anal short; ventrals small. Gills 2½; no pseudobranchiæ. Muciferous channels very conspicuous, the lateral line prominent, undulate; another series of mucous tubes extending

from lower jaw to axil; still another extending backward from snout and maxillary to a point behind eye, when it ceases, uniting with a vertical line which extends from the lateral line to the lower line; these lines thus inclose a quadrate area on the cheek. Gill opening small, well behind pectoral under front of soft dorsal. Deep seas.

(*χαύναξ*, one who gapes).

9. CHAUNAX FIMBRIATUS Hilgendorf.

Chaunax fimbriatus HILGENDORF, Gesellsch. Naturf. Freunde, 1879, p. 80; off Tokyo.
Chaunax pictus ISHIKAWA, Prel. Cat., 1897, p. 37; Japan (not of Lowe).

Head measured to the anterior edge of gill opening, $1\frac{1}{2}$ in length, excluding caudal fin; 2 in total length; depth $2\frac{3}{4}$ in body; $3\frac{1}{2}$ in total length; snout $6\frac{1}{2}$ in head; eye 2 in snout. Head wider than deep. Rostral spine short, nearly equal to eye. Gill opening below fifth or sixth soft rays of dorsal.

D. I–I–I–11; A. 6; C. 8; P. 14; V. 4. Mouth vertical, the end of maxillary not hidden. Length of maxillary $3\frac{1}{5}$ in head. Posterior part of spinous dorsal of one spine hidden in a fold of skin. Mucous channel chain-like; extending from tip of snout above eye to a point behind eye along supraorbital edge, then downward, connecting with lateral line which is abruptly bent above anal fin; branch extending backward from middle of maxillary below eye; a similar groove from lower jaw backward to upper base of pectoral fin. Series of pores below eye connected by a vertical series of pores to base of lateral line; these pores on cheek surrounding a quadrangular patch of skin. Spinules simple, rather high.

Color, in spirits, uniform pale pinkish yellow; the largest specimens dirty gray. Skin semitransparent on belly; very loose.

Coast of Japan, in rather deep water, here described from a specimen 10 inches long, from Sagami Bay. Many smaller specimens were dredged in Suruga Bay by the United States Fish Commission steamer *Albatross*, and two more in Sagami Bay.

(*Fimbriatus*, fringed).

FAMILY III. OGCOCEPHALIDÆ.

THE BAT FISHES.

Head very broad and depressed, the snout more or less elevated, the trunk short and slender. Mouth not large, subterminal or inferior, the lower jaw included; teeth villiform or cardiform. Gill openings very small, above and behind the axils of the pectoral fins. Body and head covered with bony tubercles or spines. Spinous dorsal reduced to a small rostral tentacle which is retractile into a cavity under a prominent process in the forehead; in one genus the rostral tentacle is obsolete; soft fin well developed, its base strongly

angled, with long pseudobrachia and 3 actinosts; branchiostegals, 5; no pseudobranchiæ.

a. Ogcocephalinæ: Disk with frontal region elevated and the snout more or less produced forward, the tail stout; orbit lateral; teeth on vomer and palatines; rostral tentacle present.

b. Gills 2; disk broad ..... *Malthopsis*, 5

aa. Halieutæinæ: Disk with frontal region depressed, not elevated above the rest of body; eyes partly superior; snout rounded, obtuse in front; tail slender.

c. Dorsal fin present; vomer and palatines toothless; disk subcircular; gills $2\frac{1}{2}$; mouth rather large, subvertical; prickles rather strong ..... *Halieutæa*, 6

5. MALTHOPSIS Alcock.

Malthopsis Alcock, Ann. Mag. Nat. Hist., 1891, p. 26 (*luteus*).

Disk triangular, usually wider than long, when expanded about as long as rest of body (including caudal fin); middle line of head elevated, the forehead more or less projecting beyond mouth; rostral tentacle present, its cavity about as wide as high; mouth small; minute teeth on vomer and palatines. Gills, 2.

Small fishes of the sea bottoms of Asia; differing from the New World genus *Ogcocephalus* (*Malthe*), chiefly in the reduced gills.

(*μάλθη*, *Malthe*, a synonym of *Ogcocephalus; ὄψις*, appearance.)

10. MALTHOPSIS TIARELLA Jordan, new species.

Head triangular, measured to gill opening, a little more than one-half of length exclusive of caudal fin, the elevated snout at the apex; a stout, protruding supraoral spine on the tip of snout, the height of which from eye is $7\frac{1}{7}$ in length; base of triangle of disk rather longer than the sides; the length of the latter equal to that of head. Eyes large, lateral, their diameter nearly equal to the height of supraoral spine. Snout short, about two-thirds of eye; mouth smaller than eye; a groove above mouth containing a small rostral tentacle; the cavity higher than wide; interorbital space one-half of the height of supraorbital spine; width of trunk at axil $6\frac{2}{3}$ in length. Length of tail $2\frac{1}{2}$; distance between vent to anal fin slightly more than two in tail; D. 7; A. 3; P. 10 (?); C. 6; tip of anal rays extending to root of caudal fin; root of caudal fin to anterior base of dorsal fin 3 in length; length of caudal fin $3\frac{1}{2}$ in length; ventral fin slender; pectoral fin 4 in length; depth of caudal peduncle equal to height of cavity above snout.

Cranial region elevated in front, depressed posteriorly; trunk slender, somewhat deeper than wide, tapering toward caudal fin; spines on supraorbital and occipital region rather prominent, forming two rows, leaving a clear space along median line of head. Three rows of spines on edge of head, the middle row terminating in lower jaw, the upper row dilating under eye and continued to the end of maxillary. Posterior angle of head ending in a sharp triangular protuberance with four spinules on tip. Body and wrists covered with bony plates in

irregular rows, each with a prominence in center, surmounted by a posteriorly-pointed spine. Gills, 2.

Color, gray, with a brownish patch with small dark dots around region of axil; suborbital region reticulated with brown streaks; a dark band crossing near end of caudal and pectoral fins and base of caudal fin; anal fin dark; belly dusky. Skin on dorsal side of abdominal region and ventral side of head, thin and rather loose.

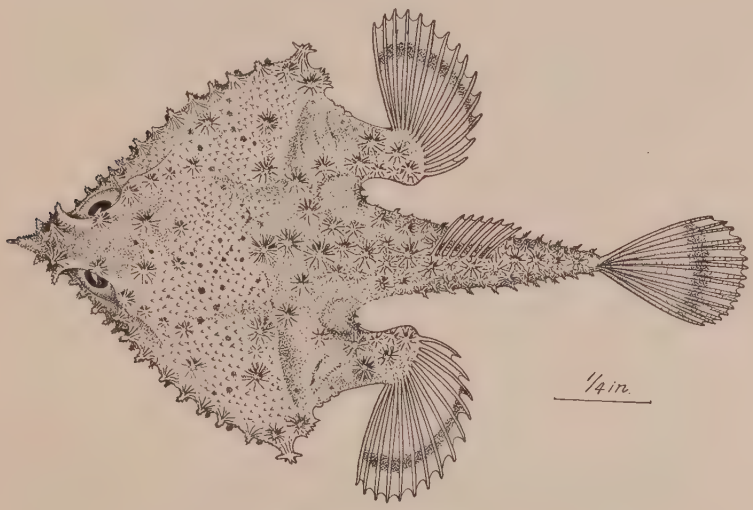

FIG. 7.—MALTHOPSIS TIARELLA.

Coast of Japan, in rather deep water; described from a specimen 1½ inches long from Suruga Bay, near Numazu, dredged by the United States Fish Commission steamer *Albatross*. This specimen is in the United States National Museum. No. 49801, U.S.N.M.

(Name, a diminutive of *tiara*, a miter.)

Measurements of Malthopsis tiarella.

Rays, D. 7; A. 3; P. 10; C. 6.	
Length in millimeters	37
Head in hundredths of length, measured to gill opening	55
Supraoral spine, from anterior edge of eye	14
Diameter of eye	13
Interorbital space	7
Width of mouth	10
Height of groove	8
Width of groove	5
Snout to posterior angle of opercle	54
Depth of head at vertical line over eye	21
Snout to dorsal fin	66
Snout to anal fin	78
Width of body at axil	15
Depth of caudal peduncle	8
Length of caudal fin	27
Length of pectoral fin	25
Snout to angle of wrist	65
Length of ventral fin	23
Length of tail	41
Vent to anal fin	21

6. HALIEUTÆA Cuvier and Valenciennes.

Halieutæa CUVIER AND VALENCIENNES, Hist. Nat. Poiss., XII, 1837, p. 455 (*stellatus*).

Head very large, broad, depressed, its outline nearly circular; cleft of mouth wide, horizontal; jaws with small cardiform teeth; no teeth on vomer or palatines. Skin everywhere covered with small, stellate spines. Forehead with a transverse bony ridge, beneath which is a tentacle, retractile into a cavity, the only rudiment of the spinous dorsal fin; soft dorsal and anal very short, far back. Gills $2\frac{1}{2}$, the anterior gill arch without laminæ. Branchiostegals 5; vertebræ 17.

(ἁλιευτής, a fisher.)

11. HALIEUTÆA STELLATA (Vahl).

AKAGUTSU (RED SHOE).

Lophius stellata VAHL, Skr. Naturh. Kjobenh., IV, p. 214, pl. III, figs. 3, 4, 1797; Japan.

Halieutæa stellata CUVIER AND VALENCIENNES, Hist. Nat. Poiss., XII, p. 456, pl. CCCLXVI; China.—SCHLEGEL, Fauna Japonica, 1846, p. 160, pl. LXXII; Nagasaki.—BLEEKER, Amboyna et Ceram., p. 279.—GÜNTHER, Cat. Fish., III, 1861, p. 203; China.—NYSTROM, Kong. Svensk. Ak., 1887, p. 37; Nagasaki.—ISHIKAWA, Prel. Cat., 1897, p. 36; Boshu, Tokyo, Ajiro, Izu.

Lophius faujas LACÉPÈDE, Hist. Nat. Poiss., I, 1798, p. 318; museum of the Hague.

Lophius muricatus SHAW, Gen. Zool., V, 1805, p. 382, pl. CLXII (after Lacépède).

Disk circular, with a groove posteriorly; wrists, with transversely projecting pectoral fins, forming angles at the beginning of the groove; diameter of disk three-fourths of length, exclusive of caudal fin; head measured to gill opening $1\frac{4}{5}$ in length; eye large, oblique, dorsal half covered by an extension of interorbital skin; mouth oblique, semi-inferior; gape 4 in length; a triangular cavity above mouth containing a stout tentacle, consisting of two equally divided lobes, with thin fleshy flaps at tip; height of cavity hardly less than its base, which is over 2 in eye; body tapering rapidly from axil toward caudal fin. Vent placed a little in advance to angle of wrist; distance from vent to root of caudal fin $2\frac{6}{7}$ in length. Vent to anal fin 2 in caudal fin; D. 5; A. 3; P. 12; V. 5; C. 8 or 9; length of caudal fin $3\frac{1}{2}$ in body; pectoral fin $3\frac{1}{5}$; ventral fin $5\frac{1}{2}$; cranial region raised; skin rather firm; dorsal surface covered with rather high, simple, straight spines, except the horny edge of disk and side of body, which are fringed with bony prominences, each terminating in three, four, or five spinules; interorbital space slightly depressed, free from spines; occipital region highest, covered with low spines, depressing gradually toward body; skin on belly and ventral side of head granular to touch, free from spines, except the bony edge of disk and mandible, which are covered with low blunt spines.

Color uniformly light yellowish, with slight brownish tinge, doubt-

less crimson or orange in life; tips of fins brown, except dorsal fin, which is somewhat lighter than other fins; tentacle slightly darker than body.

Coast of Japan, not very common. We have one specimen 68 millimeters long from Ajiro near Atami, presented by Dr. Ishikawa, from the Imperial Museum.

(*Stellatus*, starry.)

Measurements of Halieutæa stellata.

Rays, D. 5; A. 3; P. 12; V. 5; C. 8 or 9.	
Length in millemeters	68
Diameter of disk in hundredths of length	75
Head, to gill opening	58
Snout	11
Eye	11
Interorbital space	11
Gape of mouth, from angle to angle	25
Height of supraoral cavity	5⅛
Width of supraoral cavity	6
Snout to dorsal fin	70
Width of trunk at axil	16
Depth of caudal peduncle	5
Vent to root of caudal fin	35
Vent to anal fin	15
Length of caudal fin	29
Length of pectoral fin	31
Length of ventral fin	18

SUMMARY.

Family I. LOPHIIDÆ.

1. *Lophiomus* Gill.

1. *setigerus* (Vahl); Wakanoura, Nagasaki.
2. *litulon* Jordan; Tokyo, Wakanoura, Totomi Bay, Matsushima Bay.

Family II. ANTENNARIIDÆ.

2. *Pterophryne* Gill.

3. *histrio* (Linnæus); Misaki, Enoshima.
4. *ranina* (Tilesius); Wakanoura.

3. *Antennarius* Lacépède.

5. *tridens* (Schlegel); Nagasaki, Wakanoura, Kobe, Enoshima, Uraga, Misaki, Tokyo.
6. *scriptissimus* Jordan; Boshu.
7. *sanguifluus* Jordan; Misaki.
8. *nox* Jordan; Wakanoura, Nagasaki.

4. *Chaunax* Lowe.

9. *fimbriatus* Hilgendorf; Sagami Bay, Suruga Bay.

Family III. OGCOCEPHALIDÆ.

5. *Malthopsis* Alcock.

10. *tiarella* Jordan; Suruga Bay.

6. *Halieutæa* Cuvier and Valenciennes.

11. *stellata* (Vahl); Ajiro.